Please enter the following new claims, numbered claim 64 through claim 76:

64. A method for valuing any type of financial security, respective the endogenous variables of a financial security, said variables comprising Cash receipts (C), Yield (Y) and Time (T), wherein comprising steps of:

utilizing an universal pricing function, said pricing function comprising:

P = *f* { C, Y, T } where C, Y, and T are variables endogenous to the security
P = Market Price; de facto, empirical or expected market price
C = Cash Receipts; coupon, dividend, premium payments, principal/par
Y = Yield; a single term relating security's return, relative to P, C, T
T = Time; a fixed, expected or continuous measure of said security's life;

determining the values of said endogenous variables, respective said security's price, wherein further comprising step of:

determining the singular yield value for said security or for a basket of securities, wherein comprising utilizing the Formula, Yield M, or Yield Md, said Formuale comprising:

$$\text{Yield M} = \frac{\sum \text{(Maturity} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Maturity} \times \text{Portfolio Coefficient), for all issues}}$$

$$\text{Yield Md} = \frac{\sum \text{(Duration} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Duration} \times \text{Portfolio Coefficient), for all issues}}$$

where Yield M or Yield Md = Governing Yield = Y
Maturity = Time = Maturity in Years, Expected Life, Term of Policy
Portfolio Coefficient = Present Value, per issue/Present Value, $\sum$ issues
Present Value = Cost to Presently Purchase
[for bonds: Accrued Interest + (best bid Price × Face Value)]
YTM = Yield-To-Maturity, a means providing yield respective time,

where for Single Issue: its Portfolio Coefficient is one, its Yield M = its YTM
for Portfolio: said formula creating a single Yield M value of all issues;

solving said security's price using said values of said endogenous variables, or solving third endogenous variable utilizing said security's price and two of three endogenous variables.

65. The method of claim 64, which further comprises the step, for utilizing said method on calculating and computational devices, of coding said Formulae of Yield M or Yield Md, as:

Yield M =YM = (sum{(Maturity*Portfolio Coefficient*YTM)$_1$, (M*PC*YTM)$_2$,...})/
(sum{(Maturity*Portfolio Coefficient)$_1$, (M*PC)$_2$,...});

Yield Md =YMD = (sum{(Duration*PC*YTM)$_1$, (D*PC*YTM)$_2$,...})/
(sum{(Duration*Portfolio Coefficient)$_1$, (D*PC)$_2$,...}).

66. A method for determining the mathematical valuation and sensitivity functions of a financial security, wherein determining said security's Yield-to-Maturity (YTM), Duration (K) and Convexity (V) values utilizing a precise non-summation form discounting cash receipts, utilizing said security's endogenous variables of Cash receipts (C), Yield (Y) and Time (T):

determining the relation of price to Yield-to-Maturity, utilizing the Formula of:

Price to Yield-to-Maturity, a non-summation form discounting cash receipts:

$$\text{Price} = \frac{C}{Y}\left(1 - (1 + Y/2)^{-2T}\right) + (1 + Y/2)^{-2T}$$

where C = Coupon Y = YTM T = Maturity (in years),

determining the relation of Change in Price for Change in Yield, Duration, a precise first derivative of said non-summation form discounting cash receipts, utilizing the Formula of:

Duration, modified annualized, wherein semi-annual C payments:

$$K = \frac{-C}{Y^2}\left(1 - (1 + Y/2)^{-2T}\right) + \frac{C}{Y}(T + TY/2)^{-2T-1} - (T + TY/2)^{-2T-1}$$

where C=Coupon Y=YTM T=Maturity in Years $\delta Y = \Delta$Yield M $\delta P = \Delta$Price

Duration, modified annualized, wherein n annual C payments:

$$K \text{ generalized} = \frac{-C}{Y^2}\left(1 - (1 + Y/n)^{-nT}\right) + \frac{C}{Y}(T + TY/n)^{-nT-1} - (T + TY/n)^{-nT-1}$$

wherein n = # cash receipts per annum, wherein determining semi-annual form as:

$$K = \frac{-C}{Y^2} + \frac{C}{Y^2}(1 + Y/2)^{-2T} - (1 - C/Y)(T + TY/2)^{-2T-1} \quad ;$$

determining the relation of Change in the Change in Yield, Convexity, a precise second derivative of said non-summation form discounting cash receipts, utilizing the Formula of:

$$\text{Convexity } V = \frac{2C}{Y^3} - \frac{\frac{2C}{Y^3}}{(1+Y/2)^{2T}} - \frac{\frac{CT}{Y^2}}{(1+Y/2)^{2T+1}} - \frac{\frac{C}{Y^2}}{(T+TY/2)^{2T+1}} + \frac{(1+C/Y)(T^2+T/2)}{(T+TY/2)^{2T+2}}$$

wherein calculating V where Y = YTM, Yield M, or, Yield M – YTM basis.

67. The method of claim 66, which further comprises the step, for utilizing said method on calculating and computational devices, of coding said Formula of YTM, as algorithm:

semi-annual P = PR = ((C/Y)*(1–(1+(Y/2))^(-2*T))+(1+(Y/2))^(-2*T)
where C, Y and P are decimal values, T=Maturity in years,

generalized P = PRBOND= ((C/Y)*(1–(1+(Y/N))^(-N*T))+(1+(Y/N))^(-N*T)
where N=n= cash receipts per annum, wherein semi-annual=2.

68. The method of claim 66, which further comprises the step, for utilizing said method on calculating and computational devices, of coding said Formula of Duration (K), as algorithm:

K semi-annual = DPDY = ((-C/(Y^2))*(1–((1+(.5*Y))^(-2*T))))
+((C/Y)*((T+(.5*Y*T))^((-2*T) –1)))
–((T+(.5*Y*T))^((-2*T) –1))

where C and Y are decimal values, T=Maturity in years

K generalized =BONK= ((-C/(Y^2))*(1–((1+(Y/N))^(-N*T))))
+(((C/Y) –1)*T*((1+(Y/N))^((-N*T)–1)))

where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

generalized, alternate formulation
K generalized =BINK= (-C/(Y^2))+((C/(Y^2))*((1+(Y/N))^(-N*T)))
alternate form –((1–(C/Y))*((T+((T*Y)/N))^((-N*T) –1))).

69. The method of claim 66, which further comprises the step, for utilizing said method on calculating and computational devices, of coding said Formula of Convexity (V), as algorithm:

```
generalized
V      =BONV=      (((2*C)/(Y^3))*(1−(1+(Y/N))^(-N*T)))
                   −((C/Y^2)*(2*T)*((1+(Y/N))^((-N*T) −1)))
                   −(((C/Y) −1)*(((N*T)+1)*(T/N))*((1+(Y/N))^((-N*T) −2)))
where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

spread-based, semi-annual
V      =VEXA=      (((2*C)/(Y^3)) −(((2*C)/(Y^3))*((1+(Y/2))^(-2*T)))
                   −((C*T)/(Y^2))*((1+(Y/2))^((-2*T) −1))
                   −((C/(Y^2))*((T+(T*(Y/2)))^((-2*T) −1)))
             +((1+(C/Y))*((T^2)+(T/2))*((T+(T*(Y/2)))^((-2*T) −2))))/10000
where  Y=spread=YieldM−YTM, expressed in decimal, wherein if Y=0.14%=0.14
where  Y=Yield M, expressed in decimal, wherein if Y= Yield M= 6.06%= 0.0606

spread-based, generalized
V      =VEX=       (((2*C)/(Y^3)) −(((2*C)/(Y^3))*((1+(Y/N))^(-N*T)))
                   −((C*T)/(Y^2))*((1+(Y/N))^((-N*T) −1))
                   −((C/(Y^2))*((T+(T*(Y/N)))^((-N*T) −1)))
             +((1+(C/Y))*((T^2)+(T/N))*((T+(T*(Y/N)))^((-N*T) −2))))/10000
where  Y = Yield M, expressed in decimal, wherein if Y = Yield M = 6.06% = 0.0606.
```

70. A process for computing financial data using the endogenous variables of a financial security, wherein said financial security comprising a bond, equity or insurance policy, comprising:

identifying the data values for the security's endogenous variables, of C, Y, and T, wherein said variable C comprises cash receipts, and wherein said variable Y comprises yield, and wherein said variable T comprises time-to-maturity, expected life, or a fixed term;

determining governing yield, for a single security issue, wherein applying processing function Yield M (or Md), determining yield-to-maturity per summation form or per non-summation form, wherein:

function of yield-to-maturity, a summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{2} \sum_{T=1}^{2T} (1 + Y/2)^{-T} + (1 + Y/2)^{-2T}$$

where C = Coupon Y = YTM T = Maturity (in years),

wherein as coded computational processing algorithm:

Price= P = (C/2)*(sum{(((1+(Y/2))^(-T))+((1+(Y/2)^(-2*T)))$_1$,
(((1 + (Y/2)^(-T))+((1+(Y/2)^(-2*T))) $_2$,...})

where semi-annual coupon payments (2 per annum);

Price= P = (C/N)*(sum{(((1+(Y/N))^(-T))+((1+(Y/N)^(-N*T)))$_1$,
(((1 + (Y/N)^(-T))+((1+(Y/N)^(-N*T))) $_2$,...})

where N-annual coupon payments (N per annum);

function of yield-to-maturity, non-summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{Y} (1 - (1 + Y/2)^{-2T}) + (1 + Y/2)^{-2T}$$

where C = Coupon Y = YTM T = Maturity (in years),

wherein as coded computational processing algorithm:

semi-annual P = PR = ((C/Y)*(1–(1+(Y/2))^(-2*T))+(1+(Y/2))^(-2*T)
where C, Y and P are decimal values, T=Maturity in years,

generalized P = PRBOND= ((C/Y)*(1–(1+(Y/N))^(-N*T))+(1+(Y/N))^(-N*T)
where N=n= cash receipts per annum, e.g. semi-annual=2;

function of governing yield, a singular universal form for securities:

$$\text{Yield M} = \frac{\sum (\text{Maturity} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity}), \text{ for all issues}}{\sum (\text{Maturity} \times \text{Portfolio Coefficient}), \text{ for all issues}}$$

wherein Yield M as coded computational processing algorithm:

$$\text{Yield M} = \text{YM} = (\text{sum}\{(\text{Maturity*Portfolio Coefficient*YTM})_1, (\text{M*PC*YTM})_2, \ldots\})/(\text{sum}\{(\text{Maturity*Portfolio Coefficient})_1, (\text{M*PC})_2, \ldots\});$$

$$\text{Yield Md} = \frac{\sum \text{(Duration} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Duration} \times \text{Portfolio Coefficient), for all issues}}$$

wherein Yield Md as coded computational processing algorithm:

$$\text{Yield Md} = \text{YMD} = (\text{sum}\{(\text{Duration*PC*YTM})_1, (\text{D*PC*YTM})_2, \ldots\})/(\text{sum}\{(\text{Duration*Portfolio Coefficient})_1, (\text{D*PC})_2, \ldots\})$$

where Yield M = Governing Yield = Y
Maturity = Time = Maturity in Years, Expected Life, Term of Policy
Portfolio Coefficient = Present Value, per issue/Present Value, $\sum$ issues
Present Value = Cost to Presently Purchase
[for bonds: Accrued Interest + (best bid Price × Face Value)]
YTM = Yield-To-Maturity, a means providing yield respective time, determining YTM by summation or non-summation form,

for Single Issue: its Portfolio Coefficient is one, its Yield M = its YTM
for Portfolio: the functions create a single Yield M value of all issues;

determining arbitrage spreads between Yield M and spot, and Yield M and YTM, wherein said arbitrage spread comprising the differential between Yield M and spot, or YTM;

determining measures of the security's pricing sensitivities, duration and convexity, as Taylor series first and second order terms, or as first and second derivatives, respectively, wherein:

function of change in price for change in yield, duration, the first order term of a Taylor series approximation to deriving the first derivative of summed discounted cash receipts:

Duration, modified annualized:

$$\text{(Duration) Durmodan} = \frac{\frac{C}{Y^2}\left[1 - \frac{1}{(1+Y)^{2T}}\right] + \frac{2T(100 - C/Y)}{(1+Y)^{2T+1}}}{2P}$$

where $D = \Delta P/\Delta YTM$
$Y = YTM$
T = Mat. in Years
C = Coupon
P=Price (par=100),

wherein as coded computational processing algorithms:

semi-annual Durmodan=DURMOD=((((C/2)/((Y/2)^2))*(1−(1/((1+(Y/2))^(2*T)))))
+((2*T)*(100−((C/2)/(Y/2))))/((1+(Y/2))^((2*T)+1))))/(2*P)
where P = Price (of 100)

generalized Durmodan=DURMD= ((((C/N)/((Y/N)^2))*(1−(1/((1+(Y/N))^(N*T))))
+(((N*T)*(100−((C/N)/(Y/N))))/((1+(Y/N))^((N*T)+1))))/(2*P)

where N=n= # C periods per annum; semi-annual=2; T=Maturity in years;

function of change in the change in yield, convexity, the second order term of a Taylor series approximation to deriving the first derivative of summed discounted cash receipts:

$$\text{(Convexity) Convex} = \frac{\dfrac{2C}{Y^3}\left[1 - \dfrac{1}{(1+Y)^{2T}}\right] + \dfrac{2C(2T)}{Y^2(1+Y)^{2T+2}} + \dfrac{2T(2T+1)(100 - C/Y)}{(1+Y)^{2T+2}}}{4P}$$

wherein as coded computational processing algorithms:

semi-annual Convex = CON = (((C/((Y/2)^3))*(1−(1/((1+(Y/2))^(2*T)))))
−((C*(2*T))/(((Y/2)^2)*((1+(Y/2))^((2*T)+1))))
+(((2*T)*((2*T)+1)*(100-(C/Y)))/((1+(Y/2))^((2*T)+2))))/(4*P)

generalized Convex = CONDP = (((C/((Y/N)^3))*(1−(1/((1+(Y/N))^(N*T)))))
−((C*(N*T))/(((Y/N)^2)*((1+(Y/N))^((N*T)+1))))
+(((N*T)*((N*T)+1)*(100-(C/Y)))/((1+(Y/N))^((N*T)+2))))/(4*P)

where N=n= # C periods per annum; semi-annual=2; T=Maturity in years;

and wherein:

function of change in price for change in yield, duration, precise first derivative of non-summation form discounting cash receipts, utilizing endogenous variables C, Y, T only:

Duration, modified annualized, semi-annual C:

$$K = \frac{-C}{Y^2}\left(1 - (1+Y/2)^{-2T}\right) + \frac{C}{Y}(T + TY/2)^{-2T-1} - (T + TY/2)^{-2T-1}$$

where C=Coupon Y=YTM T=Maturity in Years δY=ΔYield M δP=ΔPrice

Duration, modified annualized, wherein n annual C payments:

$$K \text{ generalized} = \frac{-C}{Y^2}\left(1 - (1+Y/n)^{-nT}\right) + \frac{C}{Y}(T + TY/n)^{-nT-1} - (T + TY/n)^{-nT-1}$$

where n = # cash receipts per annum, wherein semi-annual form is determined as:

$$K = \frac{-C}{Y^2} + \frac{C}{Y^2}(1 + Y/2)^{-2T} - (1 - C/Y)(T + TY/2)^{-2T-1}$$

wherein as coded computational processing algorithms:

K semi-annual = DPDY = ((-C/(Y^2))*(1–((1+(.5*Y))^(-2*T))))
+((C/Y)*((T+(.5*Y*T))^((-2*T) –1)))
–((T+(.5*Y*T))^((-2*T) –1))
where C and Y are decimal values, T=Maturity in years

K generalized =BONK= ((-C/(Y^2))*(1–((1+(Y/N))^(-N*T))))
+(((C/Y) –1)*T*((1+(Y/N))^((-N*T)–1)))
where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

generalized, alternate formulation
K generalized =BINK= (-C/(Y^2))+((C/(Y^2))*((1+(Y/N))^(-N*T)))
alternate form –((1–(C/Y))*((T+((T*Y)/N))^((-N*T) –1)));

function of change in the change in yield, convexity, precise second derivative of non-summation form discounting cash receipts, utilizing endogenous variables C, Y, T only:

Convexity

$$V = \frac{2C}{Y^3} - \frac{\frac{2C}{Y^3}}{(1+Y/2)^{2T}} - \frac{\frac{CT}{Y^2}}{(1+Y/2)^{2T+1}} - \frac{\frac{C}{Y^2}}{(T+TY/2)^{2T+1}} + \frac{(1+C/Y)(T^2+T/2)}{(T+TY/2)^{2T+2}}$$

wherein V can be calculated where Y = YTM, Yield M, or, Yield M – YTM basis,

wherein as coded computational processing algorithms:

generalized
V =BONV= (((2*C)/(Y^3))*(1–(1+(Y/N))^(-N*T)))
–((C/Y^2)*(2*T)*((1+(Y/N))^((-N*T) –1)))
–(((C/Y) –1)*(((N*T)+1)*(T/N))*((1+(Y/N))^((-N*T) –2)))
where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

spread-based, semi-annual
V =VEXA= (((2*C)/(Y^3)) –(((2*C)/(Y^3))*((1+(Y/2))^(-2*T)))
–((C*T)/(Y^2))*((1+(Y/2))^((-2*T) –1))
–((C/(Y^2))*((T+(T*(Y/2)))^((-2*T) –1)))
+((1+(C/Y))*((T^2)+(T/2))*((T+(T*(Y/2)))^((-2*T) –2))))/10000
where Y=spread=YieldM–YTM, expressed in decimal, wherein if Y=0.14%=0.14
where Y=Yield M, expressed in decimal, wherein if Y= Yield M= 6.06%= 0.0606

spread-based, generalized

V =VEX= (((2*C)/(Y^3)) –(((2*C)/(Y^3))*((1+(Y/N))^(-N*T)))
–((C*T)/(Y^2))*((1+(Y/N))^((-N*T) –1))
–((C/(Y^2))*((T+(T*(Y/N)))^((-N*T) –1)))
+((1+(C/Y))*((T^2)+(T/N))*((T+(T*(Y/N)))^((-N*T) –2))))/10000

where Y = Yield M, expressed in decimal, wherein if Y = Yield M = 6.06% = 0.0606.

71. A process for estimating change in price of a security, or of an aggregated portfolio, respective change in yield, instantaneous or as occurring over a discrete time, comprising:

utilizing data values of said security's Yield M or Md, Duration K, and Convexity V, wherein said Yield M or Md, Duration K and Convexity V computing by operating mathematical processing codes in computer systems and computational devices, wherein:

$$\text{Yield M} = \frac{\sum \text{(Maturity} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Maturity} \times \text{Portfolio Coefficient), for all issues}}$$

wherein Yield M as coded computational processing algorithm:

Yield M =YM = (sum{(Maturity*Portfolio Coefficient*YTM)$_1$, (M*PC*YTM)$_2$,...})/
(sum{(Maturity*Portfolio Coefficient)$_1$, (M*PC)$_2$,...});

$$\text{Yield Md} = \frac{\sum \text{(Duration} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Duration} \times \text{Portfolio Coefficient), for all issues}}$$

wherein Yield Md as coded computational processing algorithm:

Yield Md =YMD = (sum{(Duration*PC*YTM)$_1$, (D*PC*YTM)$_2$,...})/
(sum{(Duration*Portfolio Coefficient)$_1$, (D*PC)$_2$,...})

where Yield M = Governing Yield = Y
Maturity = Time = Maturity in Years, Expected Life, Term of Policy
Portfolio Coefficient = Present Value, per issue/Present Value, $\sum$ issues
Present Value = Cost to Presently Purchase
[for bonds: Accrued Interest + (best bid Price × Face Value)]
YTM = Yield-To-Maturity, a means providing yield respective time,
determining YTM by summation or non-summation form,

for Single Issue: its Portfolio Coefficient is one, its Yield M = its YTM
for Portfolio: the functions create a single Yield M value of all issues;

Duration, modified annualized, semi-annual C:

$$K \quad = \frac{-C}{Y^2}\left(1 - (1 + Y/2)^{-2T}\right) + \frac{C}{Y}(T + TY/2)^{-2T-1} - (T + TY/2)^{-2T-1}$$

where C=Coupon Y=YTM T=Maturity in Years $\delta Y = \Delta$Yield M $\delta P = \Delta$Price

Duration, modified annualized, wherein n annual C payments:

$$K \text{ generalized} = \frac{-C}{Y^2}\left(1 - (1 + Y/n)^{-nT}\right) + \frac{C}{Y}(T + TY/n)^{-nT-1} - (T + TY/n)^{-nT-1}$$

wherein n = # cash receipts per annum, whereas semi-annual form can also be written:

$$K \quad = \quad \frac{-C}{Y^2} + \frac{C}{Y^2}(1 + Y/2)^{-2T} - (1 - C/Y)(T + TY/2)^{-2T-1}$$

wherein as coded computational processing algorithms:

```
K semi-annual = DPDY =   ((-C/(Y^2))*(1-((1+(.5*Y))^(-2*T))))
                         +((C/Y)*((T+(.5*Y*T))^((-2*T) -1)))
                         -((T+(.5*Y*T))^((-2*T) -1))
```

where C and Y are decimal values, T=Maturity in years

```
K generalized =BONK=     ((-C/(Y^2))*(1-((1+(Y/N))^(-N*T))))
                         +(((C/Y) -1)*T*((1+(Y/N))^((-N*T)-1)))
```

where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

generalized, alternate formulation

```
K generalized =BINK=     (-C/(Y^2))+((C/(Y^2))*((1+(Y/N))^(-N*T)))
alternate form           -((1-(C/Y))*((T+((T*Y)/N))^((-N*T) -1)));
```

Convexity

$$V \quad = \quad \frac{2C}{Y^3} - \frac{\frac{2C}{Y^3}}{(1+Y/2)^{2T}} - \frac{\frac{CT}{Y^2}}{(1+Y/2)^{2T+1}} - \frac{\frac{C}{Y^2}}{(T+TY/2)^{2T+1}} + \frac{(1+C/Y)(T^2+T/2)}{(T+TY/2)^{2T+2}}$$

wherein V can be calculated where Y = YTM, Yield M, or, Yield M – YTM basis,

wherein as coded computational processing algorithms:

generalized

```
V    =BONV=     (((2*C)/(Y^3))*(1-(1+(Y/N))^(-N*T)))
                -(((C/Y^2)*(2*T)*((1+(Y/N))^((-N*T) -1)))
                -((((C/Y) -1)*(((N*T)+1)*(T/N))*((1+(Y/N))^((-N*T) -2)))
```

where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

spread-based, semi-annual

```
V    =VEXA=     (((2*C)/(Y^3)) -(((2*C)/(Y^3))*((1+(Y/2))^(-2*T)))
                -(((C*T)/(Y^2))*((1+(Y/2))^((-2*T) -1))
```

$-((C/(Y^2))*((T+(T*(Y/2)))^((-2*T)-1)))$
$+((1+(C/Y))*((T^2)+(T/2))*((T+(T*(Y/2)))^((-2*T)-2))))/10000$

where Y=spread=YieldM−YTM, expressed in decimal, wherein if Y=0.14%=0.14
where Y=Yield M, expressed in decimal, wherein if Y= Yield M= 6.06%= 0.0606

spread-based, generalized

$$V = VEX = (((2*C)/(Y^3)) - (((2*C)/(Y^3))*((1+(Y/N))^(-N*T))) - ((C*T)/(Y^2))*((1+(Y/N))^((-N*T)-1)) - ((C/(Y^2))*((T+(T*(Y/N)))^((-N*T)-1))) + ((1+(C/Y))*((T^2)+(T/N))*((T+(T*(Y/N)))^((-N*T)-2))))/10000$$

where Y = Yield M, expressed in decimal, wherein if Y = Yield M = 6.06% = 0.0606;

identifying change in said Yield M data value at instant or as occurring over time, wherein measuring, entering or updating input values of variables determining Yield M value;

calculating the change in price of the security given said change in said Yield M by implementing factorization, wherein utilizing K for duration, Δ Price, due to Duration (K):

$$\text{A:} \quad \Delta \text{ Price, due to Duration (K)} = K \times \Delta Y;$$

calculating the change in price of the security given said change in said Yield M by implementing factorization, wherein utilizing V for convexity, Δ Price, due to Convexity (V):

$$\text{B:} \quad \Delta \text{ Price, due to Convexity (V)} = \tfrac{1}{2} \times V \times (\Delta Y)^2;$$

summing the values determined by A+B, wherein comprising Δ Price, due to K and V:

$$\Delta \text{ Price} = (K \times \Delta Y) + (\tfrac{1}{2} \times V \times (\Delta Y)^2);$$

determining arbitrage spread of computed Δ Price versus actual notched Δ Price, wherein calculating the differential between said computed and said actual notched Δ Price;

sending said determined and calculated Yield M or MD, K and V values, and said computed and actual Δ Price, and arbitrage spread to output, monitor, storage or further process.

72. The process of claim 71, which further comprises an universal factorization:

$$\Delta \text{ Price} = (-|\text{Duration}| \times \delta Y) + (\tfrac{1}{2} \times \text{Convexity} \times (\delta Y)^2);$$

wherein $\delta Y \cong \Delta Y$, and wherein $\Delta Y = \Delta$Yield M or ΔYield-to-Maturity,

wherein ΔYield-to-Maturity = YTM as non-summation, or as summation, form:

function of yield-to-maturity, non-summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{Y}\left(1 - (1 + Y/2)^{-2T}\right) + (1 + Y/2)^{-2T}$$

where C = Coupon Y = YTM T = Maturity (in years),

wherein as coded computational processing algorithm:

semi-annual P = PR = ((C/Y)*(1–(1+(Y/2))^(-2*T))+(1+(Y/2))^(-2*T)
where C, Y and P are decimal values, T=Maturity in years,

generalized P = PRBOND= ((C/Y)*(1–(1+(Y/N))^(-N*T))+(1+(Y/N))^(-N*T)
where N=n= cash receipts per annum, wherein semi-annual=2;

function of yield-to-maturity, a summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{2}\sum_{T=1}^{2T}(1 + Y/2)^{-T} + (1 + Y/2)^{-2T}$$

where C = Coupon Y = YTM T = Maturity (in years),

wherein as coded computational processing algorithm:

Price= P = (C/2)*(sum{(((1+(Y/2))^(-T))+((1+(Y/2)^(-2*T)))$_1$,
(((1 + (Y/2)^(-T))+((1+(Y/2)^(-2*T)))$_2$,...})

where semi-annual coupon payments (2 per annum);

Price= P = (C/N)*(sum{(((1+(Y/N))^(-T))+((1+(Y/N)^(-N*T)))$_1$,
(((1 + (Y/N)^(-T))+((1+(Y/N)^(-N*T)))$_2$,...})

where N-annual coupon payments (N per annum);

and wherein Duration = K, or as = first order Taylor series approximation of first derivative of summation form YTM, wherein said first order approximation comprising:

$$\text{(Duration) Durmodan} = \frac{\dfrac{C}{Y^2}\left[1 - \dfrac{1}{(1+Y)^{2T}}\right] + \dfrac{2T(100 - C/Y)}{(1+Y)^{2T+1}}}{2P}$$

where D = ΔP/ΔYTM
Y = YTM
T = Mat. in Years
C = Coupon
P=Price (par=100),

wherein as coded computational processing algorithms:

semi-annual Durmodan=DURMOD=((((C/2)/((Y/2)^2))*(1−(1/((1+(Y/2))^(2*T)))))
+((2*T)*(100−((C/2)/(Y/2))))/((1+(Y/2))^((2*T)+1))))/(2*P)
where P = Price (of 100)

generalized Durmodan=DURMD= ((((C/N)/((Y/N)^2))*(1−(1/((1+(Y/N))^(N*T))))
+(((N*T)*(100−((C/N)/(Y/N))))/((1+(Y/N))^((N*T)+1))))/(2*P)

where N=n= # C periods per annum, where semi-annual=2; T=Maturity in years;

and wherein Convexity = V, or as = second order Taylor series term, comprising second derivative approximation of summation form YTM, wherein said second order term:

$$\text{(Convexity) Convex} = \frac{\frac{2C}{Y^3}\left[1 - \frac{1}{(1+Y)^{2T}}\right] + \frac{2C(2T)}{Y^2(1+Y)^{2T+2}} + \frac{2T(2T+1)(100 - C/Y)}{(1+Y)^{2T+2}}}{4P}$$

wherein as coded algorithm:

semi-annual Convex = CON = (((C/((Y/2)^3))*(1−(1/((1+(Y/2))^(2*T)))))
−((C*(2*T))/(((Y/2)^2)*((1+(Y/2))^((2*T)+1))))
+(((2*T)*((2*T)+1)*(100-(C/Y)))/((1+(Y/2))^((2*T)+2))))/(4*P)

generalized Convex = CONDP = (((C/((Y/N)^3))*(1−(1/((1+(Y/N))^(N*T)))))
−((C*(N*T))/(((Y/N)^2)*((1+(Y/N))^((N*T)+1))))
+(((N*T)*((N*T)+1)*(100-(C/Y)))/((1+(Y/N))^((N*T)+2))))/(4*P)

where N=n= # C periods per annum, where semi-annual=2; T=Maturity in years.

73. The process of claim 71, which further comprises adding a derivative respecting time, and further comprises adding any accrued interest, wherein using dirty (full) price in A and B:

$$\Delta P = A + B + C + D$$

wherein,

ΔP = change in bid price, for given changes in yield and time,

A = -abs(Duration) × Price(dirty) × ΔY

$B = \frac{1}{2} \times \text{Convexity} \times \text{Price(dirty)} \times (\Delta Y)^2$

$C = \text{Theta} \times \text{Price(dirty)} \times \Delta t$

$D = -(\Delta \text{ Accrued Interest, for given } \Delta t)$,

and wherein,

Y (YTM), by Formula Yield M, or Yield Md, or

YTM by non-summation or by summation form function,

Duration by Formula K, or by first term Taylor series approximation,

Convexity by Formula V, or by second term Taylor series approximation,

Theta (θ), such a theta: $\theta = 2 \ln(1+r/2)$, wherein r = ytm or Yield M,

Price (dirty) equals bid price plus accumulated interest,

Δt is elapsed time between two points whereby estimations are made,

ΔP rounded to nearest pricing gradient, ΔP occurring Δt, determining arbitrage spread of computed Δ Price versus actual notched Δ Price.

74. A process for valuing a financial portfolio, containing more than one divisible issue, by singular portfolio (P) data values of endogenous variables C^P, Y^P, T^P, comprising:

identifying the data values for each issue's endogenous variables of C, Y, T, wherein:

C = Cash Receipts, periodic coupon, dividend or premium payments
Y = Yield, a single term relating security's return, relative to P, C, T
T = Time = Maturity in Years, Expected Life, Term of Policy;

generating the portfolio coefficients for each issue in portfolio, by:

Portfolio Coefficient, per each Issue = Present Value^I/Present Value^P;

Present Value^I = (AI + (Bid Price×Face Value)), per Issue (I);

Present Value^P = Σ (AI+(Bid Price×Face Value), for all Issues;

generating aggregate portfolio (P) data relating portfolio's value, by:

$$\text{Present Value}^P = \sum (AI + (\text{Bid Price} \times \text{Face Value}), \text{ for all Issues;}$$

$$\text{Accrued Interest}^P = \sum \text{Accrued Interest, AI, for all Issues;}$$

$$\text{Face Value}^P = \sum \text{Face Value, for all Issues;}$$

$$\text{Implied Price}^P = (\text{Present Value}^P - AI^P) / \sum \text{Face Value for all Issues;}$$

generating aggregate portfolio (P) data relating portfolio's variables:

$$C^P = \text{Cash Flow}^P = \sum C \times \text{Portfolio Coefficient, for all Issues;}$$

$$T^P = \text{Time}^P = \sum \text{Maturity} \times \text{Portfolio Coefficient, for all Issues;}$$

$$Y^P = \text{Yield}^P = \sum \text{Yield} \times \text{Portfolio Coefficient, for all Issues;}$$

if for a portfolio of U. S. Treasury issues, C^P, Y^P, T^P comprising:

$$C^P = \text{Coupon}^P = \sum \text{Coupon} \times \text{Portfolio Coefficient, for all Issues;}$$

$$T^P = \text{Maturity}^P = \sum \text{Maturity} \times \text{Portfolio Coefficient, for all Issues;}$$

$$Y^P = \text{Yield}^P = \sum \text{Yield} \times \text{Portfolio Coefficient, for all Issues;}$$

computing portfolio's duration and convexity:

$$\text{Duration}^P = \sum \text{Duration} \times \text{Portfolio Coefficient, for all Issues;}$$

$$\text{Convexity}^P = \sum \text{Convexity} \times \text{Portfolio Coefficient, for all Issues.}$$

or utilizing portfolio values, C^P, Y^P, T^P, computing Duration and Convexity.

75. The process of claim 74, which further comprises establishing a governing yield value for the portfolio, wherein said value also representing a yield value relative the spot forward curve, said value calculating by the Formula, Yield M, or the Formula, Yield Md,:

$$\text{Yield M} = \frac{\sum (\text{Maturity} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity}), \text{ for all issues}}{\sum (\text{Maturity} \times \text{Portfolio Coefficient}), \text{ for all issues}}$$

wherein Yield M as coded algorithm:

Yield M =YM = (sum{(Maturity*Portfolio Coefficient*YTM)$_1$, (M*PC*YTM)$_2$,...})/
(sum{(Maturity*Portfolio Coefficient)$_1$, (M*PC)$_2$,...});

$$\text{Yield Md} = \frac{\sum \text{(Duration} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Duration} \times \text{Portfolio Coefficient), for all issues}}$$

wherein Yield Md as coded algorithm:

Yield Md =YMD = (sum{(Duration*PC*YTM)$_1$, (D*PC*YTM)$_2$,...})/
(sum{(Duration*Portfolio Coefficient)$_1$, (D*PC)$_2$,...})

where Yield M = Governing Yield = Y
Maturity = Time = Maturity in Years, Expected Life, Term of Policy
Portfolio Coefficient = Present Value, per issue/Present Value, $\sum$ issues
Present Value = Cost to Presently Purchase
[for bonds: Accrued Interest + (best bid Price × Face Value)]
YTM = Yield-To-Maturity, a means providing yield respective time.

76. An apparatus, generating and computing financial data, an analytic valuation engine, comprising:

means to input values from a data-feed, stored memory or by hand-entry, for a security, or for securities in a portfolio, with respect to endogenous variables C, Y and T, wherein C comprising interest coupons, dividend payments or insurance premiums, and wherein Y comprising a single term relating said security's return respective price, C and T, and wherein T comprising maturity in years, expected life, or term of a policy;

means calculating the governing yield, the Yield M, for the security or for portfolio, wherein applying coded calculation algorithm calculating Yield M, said Yield M comprising:

function of governing yield, a singular universal form for securities

$$\text{Yield M} = \frac{\sum \text{(Maturity} \times \text{Portfolio Coefficient} \times \text{Yield-To-Maturity), for all issues}}{\sum \text{(Maturity} \times \text{Portfolio Coefficient), for all issues}}$$

wherein Yield M as coded algorithm:

Yield M =YM = (sum{(Maturity*Portfolio Coefficient*YTM)$_1$, (M*PC*YTM)$_2$,...})/

(sum{(Maturity*Portfolio Coefficient)$_1$, (M*PC)$_2$,...});

means sending said calculated value to a user monitor, storage or to a display screen;

means computing said security's market yield values using coded algorithms:

function of yield-to-maturity, a summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{2} \sum_{T=1}^{2T} (1 + Y/2)^{-T} + (1 + Y/2)^{-2T}$$

where C = Coupon   Y = YTM   T = Maturity (in years),

wherein as coded computational processing algorithm:

Price= P = (C/2)*(sum{(((1+(Y/2))^(-T))+((1+(Y/2)^(-2*T)))$_1$,
(((1 + (Y/2)^(-T))+((1+(Y/2)^(-2*T)))$_2$,...})

where semi-annual coupon payments (2 per annum);

Price= P = (C/N)*(sum{(((1+(Y/N))^(-T))+((1+(Y/N)^(-N*T)))$_1$,
(((1 + (Y/N)^(-T))+((1+(Y/N)^(-N*T)))$_2$,...})

where N-annual coupon payments (N per annum); or

function of yield-to-maturity, non-summation form of discounted cash receipts:

$$\text{Price} = \frac{C}{Y} (1 - (1 + Y/2)^{-2T}) + (1 + Y/2)^{-2T}$$

where C = Coupon   Y = YTM   T = Maturity (in years),

wherein as coded computational processing algorithm:

semi-annual P = PR = ((C/Y)*(1-(1+(Y/2))^(-2*T))+(1+(Y/2))^(-2*T)
where C, Y and P are decimal values, T=Maturity in years,

generalized P = PRBOND= ((C/Y)*(1-(1+(Y/N))^(-N*T))+(1+(Y/N))^(-N*T)
where N=n= cash receipts per annum, e.g. semi-annual=2;

means sending governing yield value and the market yield values to processing, wherein computing duration, convexity and theta of said security, wherein comprising if governing yield or market yield non-summation form utilizing applicable coded computational algorithms:

function of duration, modified annualized, semi-annual C:

$$K = \frac{-C}{Y^2}\left(1 - (1+Y/2)^{-2T}\right) + \frac{C}{Y}(T+TY/2)^{-2T-1} - (T+TY/2)^{-2T-1}$$

where C=Coupon Y=YTM T=Maturity in Years $\delta Y = \Delta$Yield M $\delta P = \Delta$Price

function of duration, modified annualized, wherein n annual C payments:

$$K \text{ generalized} = \frac{-C}{Y^2}\left(1 - (1+Y/n)^{-nT}\right) + \frac{C}{Y}(T+TY/n)^{-nT-1} - (T+TY/n)^{-nT-1}$$

wherein n = # cash receipts per annum, whereas semi-annual form can also be written:

$$K = \frac{-C}{Y^2} + \frac{C}{Y^2}(1+Y/2)^{-2T} - (1 - C/Y)(T+TY/2)^{-2T-1}$$

wherein as coded computational processing algorithms:

```
K semi-annual = DPDY =    ((-C/(Y^2))*(1-((1+(.5*Y))^(-2*T))))
                          +((C/Y)*((T+(.5*Y*T))^((-2*T) -1)))
                          -((T+(.5*Y*T))^((-2*T) -1))
```

where C and Y are decimal values, T=Maturity in years

```
K generalized =BONK=      ((-C/(Y^2))*(1-((1+(Y/N))^(-N*T))))
                          +(((C/Y) -1)*T*((1+(Y/N))^((-N*T)-1)))
```

where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

generalized, alternate formulation:

```
K generalized =BINK=      (-C/(Y^2))+((C/(Y^2))*((1+(Y/N))^(-N*T)))
alternate form            -((1-(C/Y))*((T+((T*Y)/N))^((-N*T) -1)));
```

function of convexity, semi-annual C:

$$\text{Convexity } V = \frac{2C}{Y^3} - \frac{\frac{2C}{Y^3}}{(1+Y/2)^{2T}} - \frac{\frac{CT}{Y^2}}{(1+Y/2)^{2T+1}} - \frac{\frac{C}{Y^2}}{(T+TY/2)^{2T+1}} + \frac{(1+C/Y)(T^2+T/2)}{(T+TY/2)^{2T+2}}$$

wherein V can be calculated where Y = YTM, Yield M, or, Yield M – YTM basis,

wherein as coded computational processing algorithms:

```
generalized
V      =BONV=      (((2*C)/(Y^3))*(1-(1+(Y/N))^(-N*T)))
                   -((C/Y^2)*(2*T)*((1+(Y/N))^((-N*T) -1)))
                   -(((C/Y) -1)*(((N*T)+1)*(T/N))*((1+(Y/N))^((-N*T) -2)))
```

where C and Y are decimal values; N=n= #C periods per annum; T=Maturity in years

spread-based, semi-annual

V =VEXA= (((2*C)/(Y^3)) −(((2*C)/(Y^3))*((1+(Y/2))^(-2*T)))
−((C*T)/(Y^2))*((1+(Y/2))^((-2*T) −1))
−((C/(Y^2))*((T+(T*(Y/2)))^((-2*T) −1)))
+((1+(C/Y))*((T^2)+(T/2))*((T+(T*(Y/2)))^((-2*T) −2))))/10000

where Y=spread=YieldM−YTM, expressed in decimal, wherein if Y=0.14%=0.14

where Y=Yield M, expressed in decimal, wherein if Y= Yield M= 6.06%= 0.0606

spread-based, generalized

V =VEX= (((2*C)/(Y^3)) −(((2*C)/(Y^3))*((1+(Y/N))^(-N*T)))
−((C*T)/(Y^2))*((1+(Y/N))^((-N*T) −1))
−((C/(Y^2))*((T+(T*(Y/N)))^((-N*T) −1)))
+((1+(C/Y))*((T^2)+(T/N))*((T+(T*(Y/N)))^((-N*T) −2))))/10000

where Y = Yield M, expressed in decimal, wherein if Y = Yield M = 6.06% = 0.0606;

wherein comprising if market yield summation form utilizing coded algorithms:

function of duration, modified annualized, semi-annual C:

$$\text{(Duration) Durmodan} = \frac{\dfrac{C}{Y^2}\left[1 - \dfrac{1}{(1+Y)^{2T}}\right] + \dfrac{2T(100 - C/Y)}{(1+Y)^{2T+1}}}{2P}$$

where D = ΔP/ΔYTM
Y = YTM
T = Mat. in Years
C = Coupon
P=Price (par=100),

wherein as coded computational processing algorithms:

semi-annual Durmodan=DURMOD=((((C/2)/((Y/2)^2))*(1−(1/((1+(Y/2))^(2*T)))))
+((2*T)*(100−((C/2)/(Y/2))))/((1+(Y/2))^((2*T)+1))))/(2*P)
where P = Price (of 100)

generalized Durmodan=DURMD= ((((C/N)/((Y/N)^2))*(1−(1/((1+(Y/N))^(N*T))))
+(((N*T)*(100−((C/N)/(Y/N))))/((1+(Y/N))^((N*T)+1))))/(2*P)

where N=n= # C periods per annum; semi-annual=2; T=Maturity in years;

function of convexity, semi-annual C:

$$\text{(Convexity) Convex} = \frac{\dfrac{2C}{Y^3}\left[1 - \dfrac{1}{(1+Y)^{2T}}\right] + \dfrac{2C(2T)}{Y^2(1+Y)^{2T+2}} + \dfrac{2T(2T+1)(100 - C/Y)}{(1+Y)^{2T+2}}}{4P}$$

wherein as coded computational processing algorithms:

semi-annual Convex = CON = (((C/((Y/2)^3))*(1−(1/((1+(Y/2))^(2*T)))))
−((C*(2*T))/(((Y/2)^2)*((1+(Y/2))^((2*T)+1))))
+(((2*T)*((2*T)+1)*(100-(C/Y)))/((1+(Y/2))^((2*T)+2))))/(4*P)

generalized Convex = CONDP = (((C/((Y/N)^3))*(1−(1/((1+(Y/N))^(N*T)))))
−((C*(N*T))/(((Y/N)^2)*((1+(Y/N))^((N*T)+1))))
+(((N*T)*((N*T)+1)*(100-(C/Y)))/((1+(Y/N))^((N*T)+2))))/(4*P)
where N=n= # C periods per annum; semi-annual=2; T=Maturity in years;

function of theta, utilizing coded algorithm applicable if YTM or if Yield M:

generalized Theta (θ), wherein theta: $\theta = 2 \ln(1+r/2)$, wherein r = YTM or Yield M;

means sending said yield, and its derivatives, data set to data storage or display output;

means computing factorization for change in price over time, comprising algorithm:

$$\Delta P = A + B + C + D$$

wherein,

ΔP = change in bid price, for given changes in yield and time,
A = -abs(Duration) × Price(dirty) × ΔY
B = ½ × Convexity × Price(dirty) × $(\Delta Y)^2$
C = Theta × Price(dirty) × Δt
D = -(Δ Accrued Interest, for given Δt),

and wherein,

Y (YTM), by Formula Yield M, or Yield Md, or
YTM by non-summation or by summation form function,
Duration by Formula K, or by first term Taylor series approximation,
Convexity by Formula V, or by second term Taylor series approximation,
Theta (θ), wherein theta: $\theta = 2 \ln(1+r/2)$, wherein r = YTM,
Price (dirty) equals bid price plus accumulated interest,
Δt is elapsed time between two points whereby estimations are made,
ΔP rounded to nearest pricing gradient, ΔP occurring Δt;

means sending said computed factorization values to data storage or display output;

means tabling, charting and rendering said generated data of security or portfolio.

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